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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/298,297	04/23/1999	DUNCAN W. MCBRANCH	S-91723	1892

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EXAMINER	
MARKHAM, WESLEY D	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 05/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

W

Office Action Summary	Application No.	Applicant(s)
	09/298,297	MCBRANCH, DUNCAN W.
	Examiner	**Art Unit**
	Wesley D. Markham	1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 March 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 April 1999* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

PD

DETAILED ACTION

Response to Amendment

1. Acknowledgement is made of the amendment filed by the applicant on 3/7/2005, in which a new abstract of the disclosure was submitted, and Claims 1, 14, 20, 21, and 25 were amended. **Claims 1 – 26** are currently pending in U.S. Application Serial No. 09/298,297, and an Office action on the merits follows.

Drawings

2. The six (6) sheets of drawings filed by the applicant on 4/23/1999 are acknowledged and approved by the examiner.

Specification

3. The objection to the abstract of the disclosure set forth in paragraph 3 of the previous Office action (i.e., the non-final Office action mailed on 12/6/2004) is withdrawn in light of the acceptable abstract of the disclosure submitted on 3/7/2005.

Claim Objections

4. The objection to Claims 20 and 21 set forth in paragraph 4 of the previous Office action is withdrawn in light of the applicant's amendment to clarify the informality noted by the examiner.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. The rejection of Claims 25 and 26 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, set forth in paragraph 7 of the previous Office action, <u>is withdrawn</u> in light of the applicant's amendment to correct the antecedent basis issue noted by the examiner.
7. Claims 14 – 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
8. Amended independent **Claim 14** (from which **Claims 15 – 26** depend) recites the limitation "the nonlinear optical material layer" in line 7 of the claim. There is insufficient antecedent basis for this limitation in the claim. Specifically, Claim 14 previously refers to a donor layer, a transparent spacer layer, and an acceptor layer, but does not recite or imply a "nonlinear optical material" of any sort. Therefore, it is unclear what "the nonlinear optical material" in Claim 14 refers to, and the scope of the claims is vague and indefinite. For the purposes of examination only, the examiner has reasonably interpreted "the nonlinear optical material" in Claim 14 to be "the transparent spacer layer" in order to correspond to the layers actually recited in Claim 14

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1, 9, 14, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Toshiba (EP 0 482 920 A2).

11. Regarding independent **Claim 1**, Toshiba teaches a method for generating materials which exhibit photoinduced charge transfer having a controlled direction (i.e., from the donor layer to the acceptor layer) (Abstract, page 3, lines 18 – 22, page 5, lines 31 – 37), the method comprising the steps of depositing a donor layer "D" onto a substrate (Figure 50; page 4, lines 47 – 58, page 5, lines 1 and 20 – 24, page 22, lines 21 – 58, page 23, lines 1 – 54), depositing a nonlinear optical (NLO) material "O S O" onto the donor layer (Figure 50; page 7, lines 40 – 47, page 22, lines 21 – 58, page 23, lines 1 – 54), and depositing an acceptor layer "A" onto the nonlinear optical material (Figure 50, page 5, lines 2 – 8, page 22, lines 21 – 58, page 23, lines 1 – 54), whereby photoinduced charge transfer is achieved between the donor layer and the acceptor layer (Abstract, page 3, lines 18 – 22, page 5, lines 31 – 37). Please note that the deposition cycle of acceptor layer "4", nonlinear optical layer "19", and donor layer "6" is repeated 100 times (Figure 50). As such, any one of the

lower donor layers (e.g., cycle 1, cycle 2, etc.) of Toshiba is deposited "onto a substrate", as required by the claims; any one of the middle NLO layers (e.g., cycle 5, cycle 6, etc.) is deposited "onto the donor layer", as required by the claims; and any one of the upper acceptor layers (e.g., cycle 8, cycle 9, etc.) is deposited "onto the NLO layer", as required by the claims. Amended Claim 1 further requires that the donor layer be deposited directly onto a substrate. Toshiba meets this limitation. Specifically, the examiner has broadly but reasonably interpreted the entire structure, including any underlying layers, immediately below the first donor layer to be "a substrate" (see Figure 50). As such, the first donor layer of Toshiba is deposited directly onto a substrate, as required by the claims. Additionally, amended Claim 1 requires that the donor layer, the NLO material layer, and the acceptor layer be self-assembled into a superlattice. Toshiba meets this limitation. Specifically, Toshiba teaches that the layers (donor, acceptor, NLO, and spacer layers) are deposited using a Langmuir-Blodgett (LB) technique (page 5, lines 20 – 30), and the deposition cycle is repeated 100 times (Figure 50). A LB technique is a self-assembly technique (see, for example, Cornell et al. (USPN 5,443,955) (Col.8, lines 14 – 19) and/or Wynne et al. (USPN 5,520,968) (Col.3, lines 19 – 22), which are simply cited to show that LB deposition is a self-assembly technique), and the multilayer film built-up by the LB deposition process of Toshiba is a "superlattice" (see, for example, Naito et al. (USPN 5,153,680) (Col.37, lines 5 – 9, Col.44, lines 30 – 34, Col.45, lines 58 – 68), which is simply cited to show that a multilayer LB film such as that taught by Toshiba is considered to be a "superlattice"), as required by

the claims. Toshiba does not explicitly teach that the method enhances the NLO properties of the NLO material. However, the process of Toshiba is the same as the applicant's claimed process, and the resulting product of Toshiba (i.e., an NLO material layer sandwiched between a donor layer and an acceptor layer) is the same as the product resulting from the applicant's claimed process. As such, unless essential process limitations are missing from the applicant's claims, the process of Toshiba would have inherently enhanced the NLO properties of the NLO material, as required by the claims. Regarding **Claim 9**, Toshiba also teaches that the substrate includes glass (page 22, line 23).

12. Regarding independent **Claim 14**, Toshiba teaches a method for generating materials which exhibit photoinduced energy transfer having a controlled direction (i.e., from the donor layer to the acceptor layer) (Abstract, page 3, lines 18 – 22, page 5, lines 31 – 37), the method comprising the steps of depositing a donor layer "D" onto a substrate (Figures 10 and 11; page 4, lines 47 – 58, page 5, lines 1 and 20 – 24, page 10, lines 55 – 58, page 11, lines 1 – 55); depositing a transparent spacer layer "7" onto the donor layer (Figures 10 and 11; page 4, lines 51 – 53, page 5, lines 25 – 30, page 10, lines 55 – 58, page 11, lines 1 – 55); and depositing an acceptor layer "A" onto the transparent spacer layer (Figures 10 and 11, page 5, lines 2 – 8, page 10, lines 55 – 58, page 11, lines 1 – 55), whereby energy transfer is achieved between the donor layer and the acceptor layer (Abstract, page 3, lines 18 – 22, page 5, lines 31 – 37). Amended Claim 14 further requires that the donor layer be deposited <u>directly</u> onto a substrate. Toshiba meets this limitation. Specifically, the

examiner has broadly but reasonably interpreted the entire structure, including any underlying layers, immediately below the first donor layer to be "a substrate" (see Figures 10 and 11). As such, the first donor layer of Toshiba is deposited directly onto a substrate, as required by the claims. Additionally, amended Claim 14 requires that the donor layer, the spacer layer, and the acceptor layer be <u>self-assembled into a superlattice</u>. Toshiba meets this limitation. Specifically, Toshiba teaches that the layers (donor, acceptor, NLO, and spacer layers) are deposited using a Langmuir-Blodgett (LB) technique (page 5, lines 20 – 30), and the deposition cycle is repeated a number of times (Figure 11). A LB technique is a self-assembly technique (see, for example, Cornell et al. (USPN 5,443,955) (Col.8, lines 14 – 19) and/or Wynne et al. (USPN 5,520,968) (Col.3, lines 19 – 22), which are simply cited to show that LB deposition is a self-assembly technique), and the multilayer film built-up by the LB deposition process of Toshiba is a "superlattice" (see, for example, Naito et al. (USPN 5,153,680) (Col.37, lines 5 – 9, Col.44, lines 30 – 34, Col.45, lines 58 – 68), which is simply cited to show that a multilayer LB film such as that taught by Toshiba is considered to be a "superlattice"), as required by the claims. Regarding **Claim 24**, Toshiba also teaches that the substrate includes glass (page 10, line 55; page 11, line 45).

13. Claims 14, 15, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Schrepp et al. (USPN 5,294,402).

14. Regarding independent **Claim 14**, Schrepp et al. teaches a method for generating materials which exhibit energy transfer having a controlled direction (Col.3, lines 10 – 39), which comprises the steps of depositing a donor layer "D" directly onto a substrate "S" (see Figure 5 and Col.1, lines 60 – 64), depositing an intermediate layer "Z" consisting of, for example, long-chain alcohols, carboxylic acids, esters, amines, or inert organic polymers having a total thickness of as little as 20 Angstroms (i.e., "a transparent spacer layer") onto the donor layer, and depositing an acceptor layer "A" onto the intermediate layer, whereby energy transfer is achieved between the donor layer and the acceptor layer (Abstract, Figure 5, Col.1, lines 60 – 68, Col.2, lines 1 – 50, Col.3, lines 3 – 39, and Cols. 5 – 8 (for the donor layer), and Cols. 8 – 10 (for the acceptor layer)). Additionally, amended Claim 14 requires that the donor layer, the spacer layer, and the acceptor layer be self-assembled into a superlattice. Schrepp et al. meets this limitation. Specifically, Schrepp et al. teaches that the layers are all deposited using a Langmuir-Blodgett (LB) technique (Col.2, lines 36 – 41). A LB technique is a self-assembly technique (see, for example, Cornell et al. (USPN 5,443,955) (Col.8, lines 14 – 19) and/or Wynne et al. (USPN 5,520,968) (Col.3, lines 19 – 22), which are simply cited to show that LB deposition is a self-assembly technique), and the multilayer film built-up by the LB deposition process of Schrepp et al. is a "superlattice" (see, for example, Naito et al. (USPN 5,153,680) (Col.37, lines 5 – 9, Col.44, lines 30 – 34, Col.45, lines 58 – 68), which is simply cited to show that a multilayer LB film is reasonably considered to be a "superlattice"), as required by the claims. Regarding

Claim 15, Schrepp et al. also teaches that the donor is a "conjugated polymer" (Col.6, lines 49 – 53, Col.8, lines 1 – 6), and the acceptor layer is a "porphyrin" (Col.10, lines 1 – 39). Regarding **Claim 24**, Schrepp et al. also teaches that the substrate includes glass (Col.5, lines 4 – 13).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. The rejection of Claims 1 and 2 under 35 U.S.C. 103(a) as being unpatentable over Oldenburg et al. (USPN 6,344,272) in view of Thompson (USPN 6,107,561), set forth in paragraph 17 of the previous Office action, <u>is withdrawn</u> in light of the applicant's amendment to the independent claims to require that the donor layer, NLO material layer, and acceptor layer be self-assembled into a superlattice on the substrate, a limitation not reasonably suggested by the combination of Oldenburg et al. and Thompson.

17. Claims 1 – 3, 5 – 16, and 18 – 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toshiba in view of Thompson (USPN 6,107,561), and in further view of Roberts et al. (US H2046 H), Lvov et al. ("Non-linear optical effects in layer-

by-layer alternate films of polycations and an azobenzene-containing polyanion", 1997), McBranch et al. (USPN 5,741,442), and Yu et al. (USPN 6,441,395 B1).

18. As an alternative (or in addition to) to the reasoning set forth above in paragraphs 11 and 12, Toshiba teaches all the limitations of **Claims 1 – 3 and 14 – 16**, except for a method wherein the layers are deposited in the order claimed by the applicant (i.e., donor layer directly on substrate, NLO material and/or transparent spacer layer on donor layer, and acceptor layer on NLO material and/or transparent spacer layer), wherein the donor layer and acceptor layer are selected from the group consisting of conjugated polymers, fullerenes, porphyrins, and phthalocyanines, and wherein the conjugated polymers include conjugated polyelectrolytes. Specifically, Toshiba teaches that the layers (donor, acceptor, NLO, and spacer layers) are deposited using a Langmuir-Blodgett (LB) technique (page 5, lines 20 – 30). Thompson teaches that, in the art of producing a multilayer thin film in which charge transfer is achieved between a donor layer and an acceptor layer (i.e., a process analogous to that of Toshiba), the order of the layers (i.e., substrate-donor-acceptor, or substrate-acceptor-donor) determines the direction of current flow (Abstract, Col.3, lines 1 – 3, Col.11, lines 19 – 45). As such, it would have been obvious to one of ordinary skill in the art to <u>either</u> (1) deposit the layers of Toshiba in the order claimed by the applicant (i.e., donor layer <u>directly</u> on substrate (see paragraphs 11 and 12 above), NLO material or transparent spacer layer on donor layer, and acceptor layer on NLO material or transparent spacer layer), or (2) deposit the layers of Toshiba in the order opposite to that claimed by the applicant (i.e., acceptor layer on substrate, NLO

material or transparent spacer layer on acceptor layer, and donor layer on NLO material or transparent spacer layer), depending on the direction of current flow (i.e., charge transfer) desired by the purveyor in the art. In other words, since Thompson teaches that the order of the layers determines the direction of current flow (i.e., the order of the layers is a result / effective variable), one of ordinary skill in the art would have reasonably been expected to optimize the order of the layers based on whether the resulting device requires current flowing toward the substrate or away from the substrate. Additionally, Roberts et al. teaches that, in the art of producing NLO material based multilayer films, alternating polyelectrolyte deposition (APD) is preferable to a LB technique because (1) it allows many more substrates to be coated simultaneously in an automated process in comparison to an LB process, and (2) it eliminates the need for large bulky hydrophobic groups usually required by LB processing (Abstract, Col.4, lines 24 – 35 and 62 – 65, Col.5, lines 39 – 53, and Col.11, lines 5 – 19). Therefore, it would have been obvious to one of ordinary skill in the art to utilize APD (which is considered by the applicant to be a self-assembly technique – see, for example, page 9 of the applicant's specification) to deposit the multilayer films of the combination of Toshiba and Thompson, as opposed to LB deposition (as taught by Toshiba), with the reasonable expectation of successfully and advantageously reaping the benefits of APD taught by Roberts et al., such as allowing many more substrates to be coated simultaneously in an automated process in comparison to an LB process, and eliminating the need for large bulky hydrophobic groups usually required by LB processing. In doing so, one of ordinary

skill in the art would have reasonably been expected to utilize materials known in the art to function in the manner desired by Toshiba (i.e., as donor layers, acceptor layers, NLO material layers, and transparent spacer layers) and capable of being deposited by a solution-based technique such as APD so as to successfully and advantageously produce the multilayer films(s) desired by Toshiba. Such materials are taught by Roberts et al. (Cols. 5 – 10, which describe various NLO-active polycations and polyanions, as well as various NLO-inactive polycations and polyanions that are capable of being used as transparent buffer layers), Lvov et al. (Abstract, pages 107 – 109 and 111, which describe PAZO as an NLO-active sidechain polyelectrolyte, as well as various other conjugated polyelectrolytes), McBranch et al. (Cols.1 – 6, which describe soluble functionalized derivatives of C_{60} suitable for use as a charge / electron acceptor material), and Yu et al. (Cols. 8 – 9, which describe various conjugated polymers suitable for use as donor layers, and functionalized derivatives of C_{60} suitable for use as acceptor layers), and include fullerenes and conjugated polymers / polyelectrolytes, as claimed by the applicant. As the multilayer film produced by the deposition method taught by the aforementioned combination of references is the same as the applicant's claimed film (i.e., a self-assembled multilayer film comprising donor, NLO, spacer, and acceptor layers), such a multilayer film is reasonably considered to be a "superlattice", as required by the claims. The aforementioned combination of references also teaches that the fullerenes include functionalized derivates of C_{60} having ionic groups such that the fullerenes are rendered water-soluble **(Claims 5**

and 18) (Cols.1 – 6 of McBranch et al.); the substrate includes glass (**Claims 9 and 24**) (see the Examples of Toshiba); and the donor layer, acceptor layer, NLO material layer, and transparent spacer layer are deposited by using ion-self assembly from aqueous solution (i.e., APD, as taught by Roberts et al. – see the discussion of Claims 1 – 3 and 14 – 16 above) (**Claims 10 and 25**). Regarding **Claims 6 and 7**, Roberts et al. also teaches that it is desirable to deposit various NLO-inactive polyelectrolyte buffer layers (i.e., "transparent spacer layers") throughout the thickness of the multilayer film in order to smooth the polycation or polyanion films (i.e., the NLO-active films), create a fresh surface, modify the refractive index, etc. (Col.10, lines 33 – 51). Therefore, it would have been obvious to one of ordinary skill in the art to deposit such transparent spacer layers at any point throughout the thickness of the film, including "between neighboring donor and acceptor layers" (as claimed by the applicant) with the reasonable expectation of reaping the benefits of depositing such buffer layers, such as smoothing the films, creating a fresh surface for deposition, modifying the refractive index, etc. By doing so, the structure of the multilayer film taught by the prior art would be the same as the structure of the film claimed by the applicant, and as such, "self-quenching" would have inherently been eliminated, as required by Claim 6. Regarding **Claim 8**, Roberts et al. also teaches that the polyelectrolyte buffer layer is, for example, PSS (Col.7, lines 64 – 67). Regarding **Claims 19 and 22**, Roberts et al. also teaches that it is desirable to deposit various NLO-inactive polyelectrolyte buffer layers (i.e., "transparent spacer layers") throughout the thickness of the multilayer film in order to

smooth the polycation or polyanion films (i.e., the NLO-active films), create a fresh surface, modify the refractive index, etc. (Col.10, lines 33 – 51). Therefore, it would have been obvious to one of ordinary skill in the art to deposit such transparent spacer layers at any point throughout the thickness of the film, including between the NLO material layer(s) and the acceptor layer(s) (as claimed by the applicant) with the reasonable expectation of reaping the benefits of depositing such buffer layers, such as smoothing the films, creating a fresh surface for deposition, modifying the refractive index, etc. Regarding **Claim 23**, Roberts et al. also teaches that the polyelectrolyte buffer layer (i.e., transparent spacer layer) is, for example, PSS (Col.7, lines 64 – 67). Regarding **Claims 12, 13, 20, and 21**, the combination of references also teaches that the NLO-material includes polymers having NLO chromophores as side chain substituents to the polymer backbone, specifically PAZO (Abstract, pages 107 – 109 of Lvov et al.). Regarding **Claims 11 and 26**, the combination of references does not explicitly teach that the conformation of the donor layer is controlled by varying the pH of the aqueous deposition solution. However, Roberts et al. teaches that, in the art of depositing a film by APD, the polycation and polyanion solutions are preferably water based and are controlled to have a pH within a specific range (Col.9, lines 48 – 60). Therefore, it would have been obvious to one of ordinary skill in the art to control the pH in the APD process of the aforementioned combination of references (i.e., during the deposition of the donor layer, acceptor layer, NLO material layer, and transparent spacer layer) in order to insure that the APD is successfully carried out. By controlling the solution

pH during deposition, the conformation of the donor layer would have inherently been "controlled by varying the pH", as claimed by the applicant.

19. Claims 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toshiba in view of Thompson (USPN 6,107,561), in further view of Roberts et al. (US H2046 H), Lvov et al. ("Non-linear optical effects in layer-by-layer alternate films of polycations and an azobenzene-containing polyanion", 1997), McBranch et al. (USPN 5,741,442), and Yu et al. (USPN 6,441,395 B1), in further view of Jacobson et al. (USPN 6,445,489 B1).

20. The combination of Toshiba, Thompson, Roberts, Lvov, McBranch, and Yu teaches all the limitations of **Claims 4 and 17** as set forth above in paragraph 18, except for a method wherein the conjugated polymers include the water-soluble, anionic form of <u>MPS-PPV</u>. However, Roberts et al. teaches that the APD process should be carried out by using the water-soluble, polyelectrolyte (anionic or cationic) form of various polymers (Cols. 5 – 9), and Yu et al. teaches that PPV or a PPV derivative is suitable for use as a donor layer in a multilayer donor / acceptor structure (Cols. 8 – 9). Jacobson et al. teaches that MPS-PPV was a well-known derivative of PPV at the time of the applicant's invention (Col.5, lines 66 – 67, Col.6, lines 1 – 7). Therefore, it would have been obvious to one of ordinary skill in the art to utilize the water-soluble, polyelectrolyte (anionic or cationic) form of a PPV-derivative such as MPS-PPV as the donor layer in the process of the combination of Toshiba, Thompson, Roberts, Lvov, McBranch, and Yu with the reasonable expectation of (1)

success, as Yu et al. teaches that PPV derivatives in general are suitable as donor layers in a multilayer donor / acceptor structure, and (2) obtaining similar results (i.e., charge / energy donation by the donor layer), regardless of the specific PPV-derivative used for the donor layer.

Response to Arguments

21. Applicant's arguments filed on 3/7/2005 have been fully considered but they are not persuasive.

22. Regarding the 35 U.S.C. 102 and 103 rejections, the applicant argues that the references do not teach or suggest (1) depositing the donor layer directly onto a substrate and/or (2) self-assembling the layers (donor, acceptor, NLO, and/or transparent spacer) into a superlattice.

23. In response, these arguments are not convincing for the reasons set forth in the grounds of rejection above (see paragraphs 11, 12, 14, and 18, in which the examiner particularly points out how and why the prior art of record teaches the limitations argued by the applicant).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kossovsky et al. (USPN 5,506,420) teaches depositing multilayer films comprising donor, acceptor, and insulator layers on a substrate by a LB technique (Col.11, lines 25 – 40). Pichler et al. (USPN 6,850,003, representative of WO 99/13692)

teaches a method of making an organic light emitting device (OLED) by polyelectrolyte self-assembly.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D. Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wesley D Markham
Examiner
Art Unit 1762

WDM

WDM

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER